RESIDENTIAL SUBDIVISION SERVICING AND DESIGN PRACTICES

REFERENCE MANUAL

Alberta
MUNICIPAL AFFAIRS
Innovative Housing Grants Program

RESIDENTIAL SUBDIVISION
SERVICING AND DESIGN PRACTICES
REFERENCE MANUAL

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The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of the Alberta Department of Housing. In May, 1986, the Alberta Department of Housing was amalgamated with Alberta Municipal Affairs which is now responsible for issuing this report.

The Innovative Housing Grants Program is intended to encourage and assist housing research and development which will reduce housing costs, improve the quality and performance of dwelling units and subdivisions, or increase the long term viability and competitiveness of Alberta's housing industry.

The Program offers assistance to builders, developers, consulting firms, professionals, industry groups, building products manufacturers, municipal governments, educational institutions, non-profit groups and individuals. At this time, priority areas for investigation include building design, construction technology, energy conservation, site and subdivision design, site servicing technology, residential building product development or improvement and information technology.

As the type of project and level of resources vary from applicant to applicant, the resulting documents are also varied. Comments and suggestions on this report are welcome. Please send comments or requests for further information to:

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INTRODUCTION

The analyses and discussions in the accompanying report, "Residential Subdivision Services and Design Practices" led to the development of a tabular form for the comparison of the various elements of subdivision servicing. This form has several objectives:

1. To allow for a quick comparison of the standards presently being used by the eight Alberta Municipalities.

2. To enable a comparison of these standards with the cross-Canada range which was found in the literature review.

3. To present the most common suggestions which were found in the literature for improving cost-effectiveness.

4. To present a brief analysis indicating the minimum requirement necessary for any individual subdivision element to achieve its intended purpose and to present a suggested servicing standard for consideration.

5. To facilitate feedback, update and expansion.

The form can be used for each element and circulated to municipalities for comment. The criteria used in developing the form were as follows:

a) the element, its classification and primary function,

b) the range of standards within the eight Alberta municipalities already surveyed,

c) the range determined by the literature review on current usage throughout Canada,

d) the recommendations found in the literature for modificiations to standards to achieve cost savings,

e) a brief analysis comparing current usage, design considerations and recommendations,

f) a suggested standard,

g) a graphic presentation of the suggested ideas, and

h) a space for comment by the municipalities.

The intent of the form is to increase awareness of Alberta municipalities of potential for cost savings in subdivision servicing, and to allow feedback of ideas. This feedback can be used to update the forms yearly. The forms can provide the basis for discussion and each element can be analyzed individually.

Subdivision elements are classified in the following broad categories, with individual forms set up to deal with each element separately:

Category 1	Waterworks
Category 2	Sanitary Sewer
Category 3	Storm Drainage
Category 4	Roadways
Category 5	Planning

Each category is assigned a code number for individual elements under that category. It should be noted that only those elements where cost savings relative to current usage have been identified were considered in the analysis. The codes for individual elements are listed as follows:

Category 1	Waterworks
Code 1.1	Size of waterline beyond last hydrant
Code 1.2	Hydrant Spacing
Code 1.3	Line Valves
Code 1.4	House Service Connections
Category 2	Sanitary Sewer
Code 2.1	Minimum Pipe Sizes
Code 2.2	Minimum Gradients
Code 2.3	Manholes
Code 2.4	House Service Connections
Category 3	Storm Drainage
Code 3.1	Piped System
Code 3.2	Minimum Gradients
Code 3.3	Manholes
Code 3.4	Catch Basins
Code 3.5	House Service Connections
Category 4	Roadways
Code 4.1A	Local Road Right-of-Way
Code 4.1B	Minor Local Road Right-of-Way
Code 4.2A	Local Road Pavement Width
Code 4.2B	Minor Local Road Pavement Width
Code 4.3	Lanes
Code 4.4	Sidewalks

Category 5	Planning
Code 5.1	Housing Mix
Code 5.2	Zero Lot Line Concept
Code 5.3	Housing Density
Code 5.4A	Lot Area
Code 5.4B	Lot Shape
Code 5.5	Setbacks

The form makes a brief statement on the main purpose of the individual subdivision servicing elements and then presents a comparison of the standards currently being used by eight Alberta Municipalities (Calgary, Edmonton, Fort McMurray, Hinton, Lethbridge, Red Deer, Sherwood Park and St. Albert). The data on these eight municipalities was collected by Associated Engineering Services Ltd. in a previous study.

The range of current practice across Canada was obtained from a study completed by Paul Theil Associates*, comparing 43 municipalities from Victoria, British Columbia to St. John's, Newfoundland.

The "Literature Recommendations for Cost Effectiveness" section presents a common denominator or averaging out of the various recommendations which were put forward in the reports reviewed through Chapter One of this study.

A brief analysis is given, together with schematic drawings on the reverse side, which briefly describes the requirements that any given element theoretically should meet to achieve its primary function. From the analysis follows a suggested standard which is presented for consideration by the municipality reviewing the form.

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* Comparative Subdivision Study - Cost Analysis of New Techniques, Paul Theil Associates Ltd., 1979.

At the bottom of the form is a section for the Municipality's name, a statement of the current standard it is using for that element and a space for consideration of modifying that standard if it appears advantageous to do so.

It is the intent of this format to circulate it to municipalities throughout Alberta so that they review their current standard, compare it with respect to the other eight municipalities already surveyed, and analyze it with respect to local conditions, preferences, current maintenance costs, etc.

It is hoped that having this series of forms on hand will also assist many of the smaller municipalities in establishing policy and reacting with better insight to development proposals. It is evident that the number of forms can grow as more elements of subdivision servicing are analyzed and improved upon. If each municipality is allowed to maintain this data bank current, there is no doubt that much benefit can be derived from the communicative process and on-going transfer of technology.

ELEMENT	Waterline	**CATEGORY**	Waterworks
PURPOSE	To supply domestic water to dwellings		
		DATE	June, 1986
SUBJECT	Size of water line beyond last hydrant	**CODE**	1.1

ALBERTA RANGE (SURVEYED)

CALGARY	150 mm	**LETHBRIDGE**	150 mm
EDMONTON	200 mm	**RED DEER**	150 mm
FT. McMURRAY	150 mm	**SHERWOOD PARK**	150 mm
HINTON	150 mm	**ST. ALBERT**	200 mm

LITERATURE RANGE (CURRENT USAGE) 200 mm to 50 mm

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

50 mm diameter is recommended as the minimum for domestic supply only, provided furthest dwelling is within coverage of last hydrant. 150 mm diameter is recommended minimum for fire protection.

ANALYSIS

Since the last hydrant provides firefighting coverage, smaller lines are adequate to supply domestic requirements. This has the advantage of increased velocity over larger pipes and decreased potential for sedimentation. A flushout at the end of the line should be provided. Most commonly, this can be used in short culs-de-sac.

SUGGESTED STANDARD

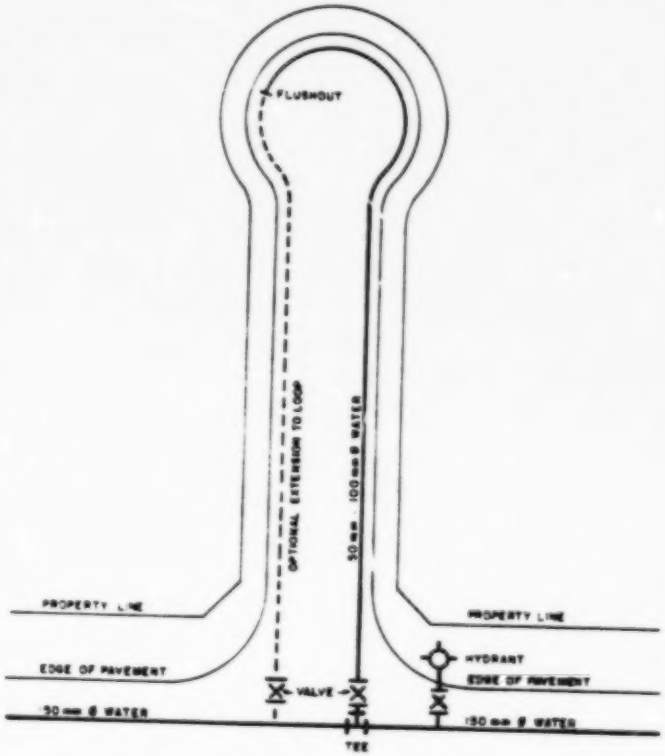
Allow smaller diameter lines for domestic supply beyond last hydrant and within the hydrant's firefighting coverage. Provide a flush-out or self-draining standpipe at end of the line. Where hydrants connect to the line, use minimum 150 mm diameter.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



(USE FOR FORTY DWELLINGS OR LESS - HYDRANT TO BE LESS THAN 150 METRES FROM FURTHEST DWELLING)

SIZE OF WATER LINE BEYOND LAST HYDRANT	I.I

COMMENTS

ELEMENT	Hydrants	CATEGORY	Waterworks
PURPOSE	To provide water for firefighting		
		DATE	June, 1986
SUBJECT	Hydrant Spacing and Distance	CODE	1.2

ALBERTA RANGE (SURVEYED)

CALGARY	300 m	LETHBRIDGE	100 m
EDMONTON	150 m	RED DEER	150 m
FT. McMURRAY	150 m	SHERWOOD PARK	150 m
HINTON	150 m	ST. ALBERT	150 m

LITERATURE RANGE (CURRENT USAGE) 300 m to 76 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

300 m	For on-line spacing.
150 m	From furthest dwelling.

ANALYSIS

Spacing for firefighting should be determined by the available coverage of the firefighting unit. Underwriters have traditionally doubled the coverage to provide for hydrant malfunction. Malfunction records on modern hydrants are rare enough to warrant dropping this contingency, as many cities have.

SUGGESTED STANDARD

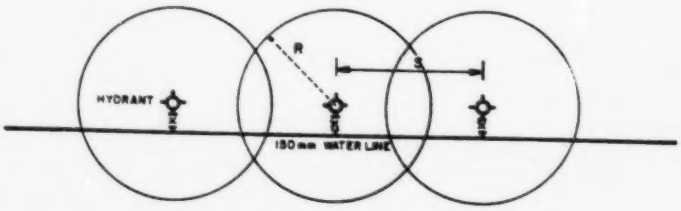
Relate hydrant spacing to coverage of available firefighting equipment. Update as new equipment is purchased.

MUNICIPALITY OF

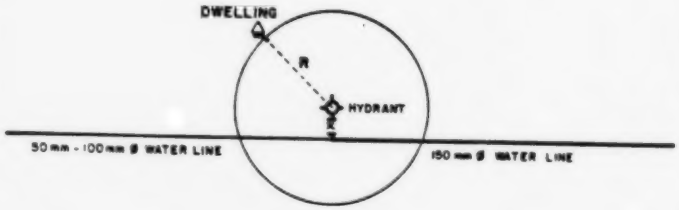
PRESENT STANDARD _____

REVISED STANDARD _____

_____



HYDRANTS: On-Line Spacing



LAST HYDRANT: Distance to Furthest Dwelling

R = RADIUS OF INFLUENCE-TO REFLECT CURRENT FIRE-FIGHTING EQUIPMENT

S = ON-LINE SPACING (2 X R) LESS A NOMINAL OVERLAP

HYDRANT SPACING & DISTANCE	1.2

COMMENTS

ELEMENT	Line valves	CATEGORY	Waterworks
PURPOSE	To isolate parts of the network for repair, testing or cleaning	DATE	June, 1986
SUBJECT	Line valve spacing	CODE	1.3

ALBERTA RANGE (SURVEYED) N/A = Not Available

CALGARY	N/A	LETHBRIDGE	N/A
EDMONTON	N/A	RED DEER	N/A
FT. McMURRAY	N/A	SHERWOOD PARK	N/A
HINTON	N/A	ST. ALBERT	N/A

LITERATURE RANGE (CURRENT USAGE) 250 m to 150 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Literature recommends that spacing be determined on the basis of placing no more than 40 dwellings out of service during shutdown.

ANALYSIS
Two valves at a Tee intersection and 3 at a cross intersection are considered necessary. The practice of relating line valve spacing to number of dwellings rather than arbitrary spacing appears sensible.

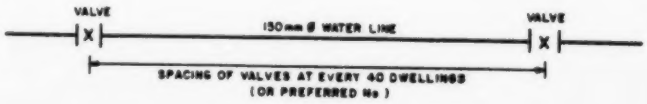
SUGGESTED STANDARD
Valves required at intersections. Relate line valve spacing requirements to number of dwellings affected by shutdown.

MUNICIPALITY OF

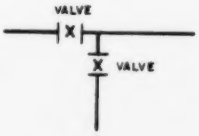
PRESENT STANDARD _____

REVISED STANDARD _____

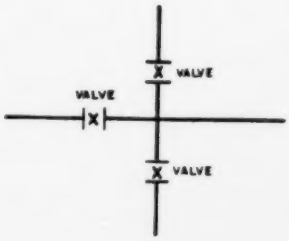
_____



Line - Valve Spacing



Tee Intersection



Cross Intersection

LINE VALVES AND INTERSECTION VALVES	1.3

COMMENTS

ELEMENT	House service connections	CATEGORY	Waterworks
PURPOSE	To supply adequate domestic water to each home	DATE	June, 1986
SUBJECT	Shared Water House Service Connections	CODE	1.4

ALBERTA RANGE (SURVEYED) No = Not Allowed

CALGARY	No	LETHBRIDGE	No
EDMONTON	No	RED DEER	No
FT. McMURRAY	No	SHERWOOD PARK	No
HINTON	No	ST. ALBERT	No

LITERATURE RANGE (CURRENT USAGE) Usage has increased in recent years.

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

Out of 39 municipalities across Canada, 19 allow shared connections and 20 do not. The literature indicates that shared connections are feasible and cost effective.

ANALYSIS

Shared connections reduce the number of service trenches and thereby reduce construction and maintenance costs.

SUGGESTED STANDARD

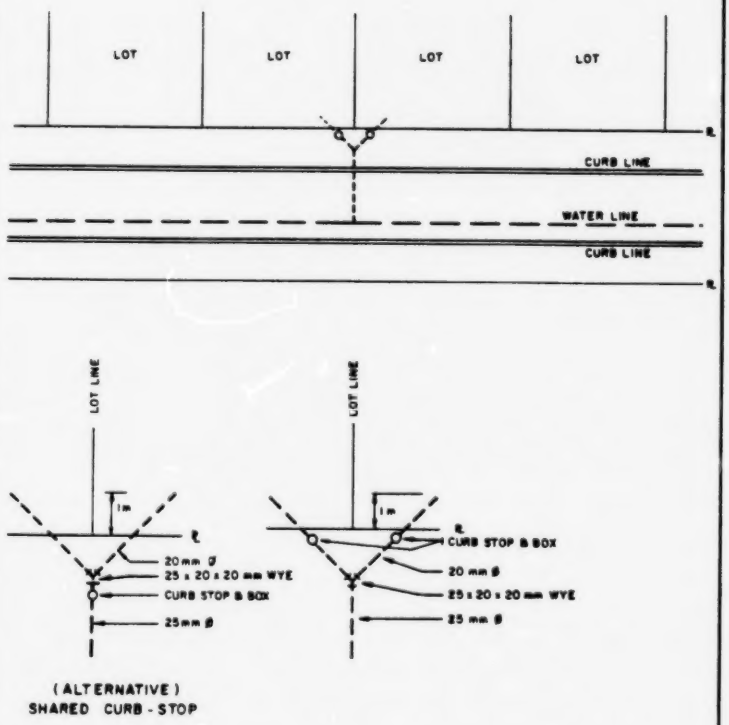
Shared service connections can be allowed provided they are adequately designed and installed.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



SHARED WATER LINE HOUSE CONNECTIONS	1.4

COMMENTS

ELEMENT	Piped System	CATEGORY	San. Sewers
PURPOSE	To convey domestic wastewater to disposal point	DATE	June, 1986
SUBJECT	Minimum pipe size for Sanitary Sewer	CODE	2.1

ALBERTA RANGE (SURVEYED) N/A = Not Available

CALGARY	200	LETHBRIDGE	N/A
EDMONTON	N/A	RED DEER	N/A
FT. McMURRAY	N/A	SHERWOOD PARK	N/A
HINTON	N/A	ST. ALBERT	N/A

LITERATURE RANGE (CURRENT USAGE) 250 mm to 150 mm

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Use of 150 mm Ø is cost effective in both material and installation costs.
Use of 100 mm Ø is not recommended except for individual dwellings.

ANALYSIS

Use of 150 mm Ø as a minimum size for up to 200 dwellings should be acceptable when no future upstream connection is proposed. Blockages can be minimized by use of adquate gradients (see Code No. 2.2). Alberta Environment currently requires a minimum of 200 mm Ø.

SUGGESTED STANDARD

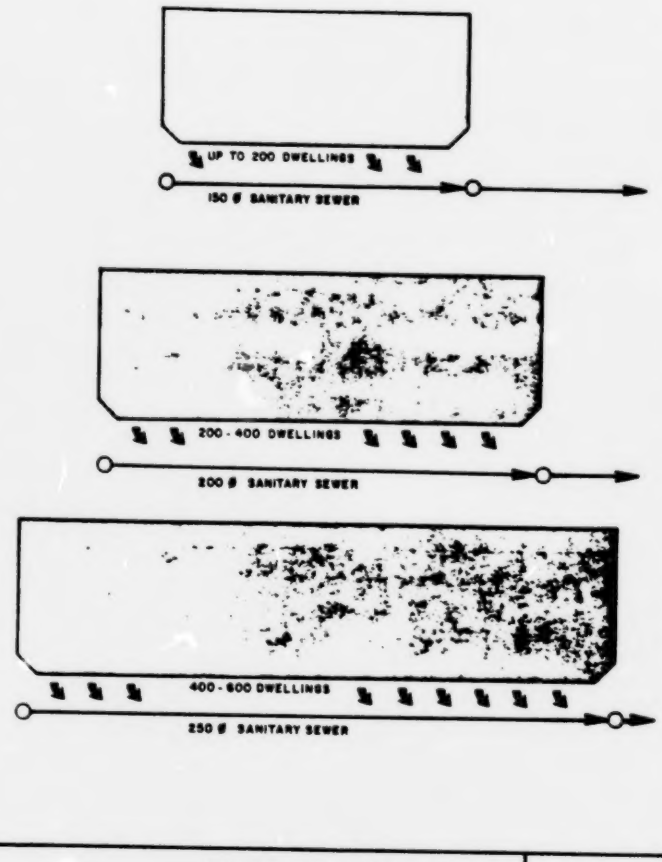
Number of homes served	Minimum pipe size
up to 200	150 mm
200 to 400	200 mm
400 to 600	250 mm

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



MINIMUM PIPE SIZE FOR SANITARY SEWER	2.1

COMMENTS

ELEMENT	Piped system	CATEGORY	San. sewers
PURPOSE	To achieve velocity adequate to prevent sedimentation	DATE	June, 1986
SUBJECT	Minimum Sanitary Sewer Pipe Gradients	CODE	2.2

ALBERTA RANGE (SURVEYED) * metres/second

CALGARY	0.76 m/s	LETHBRIDGE	0.6 m/s*
EDMONTON	0.6 m/s	RED DEER	0.6 m/s
FT. McMURRAY	0.76 m/s	SHERWOOD PARK	0.6 m/s
HINTON	0.6 m/s	ST. ALBERT	0.6 m/s

LITERATURE RANGE (CURRENT USAGE) 0.9 m/s to 0.6 m/s

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

In very flat terrain it is cost effective to use a minimum velocity of 0.6 m/s. Although many sewers have been installed for lower velocities, it is generally not recommended.

ANALYSIS

A velocity of 0.75 m/s is desirable to minimize sedimentation. However, in very flat terrain, a minimum velocity of 0.6 m/s should be adequate. Gradients are determined from average roughness factor of 0.013 and inside diameter. Long-term roughness factor of various types of pipes is not known.

SUGGESTED STANDARD

Using a Manning "n" roughness factor of 0.013, the following are suggested gradients:

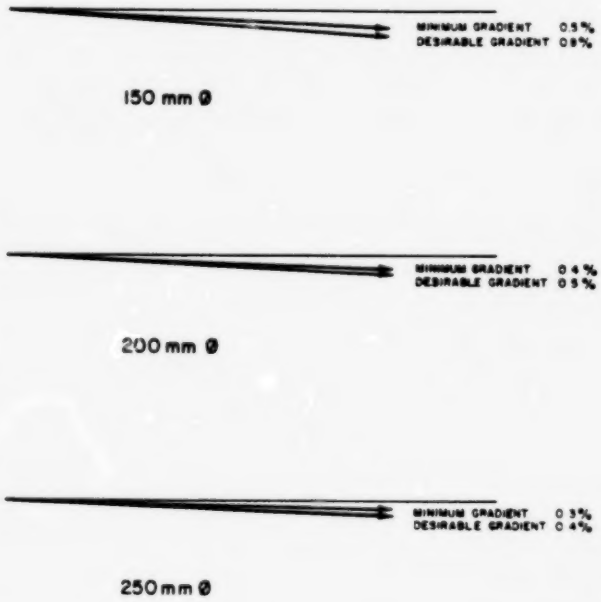
Pipe Size (mm)	Desirable Gradient (%)	Minimum Gradient (%)
150	0.8	0.5
200	0.5	0.4
250	0.4	0.3

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



MINIMUM SANITARY SEWER PIPE GRADIENTS	2.2

COMMENTS

ELEMENT	Manholes	CATEGORY	San. sewers
PURPOSE	To allow access to piped system		
		DATE	June, 1986
SUBJECT	Maximum Allowable Manhole Spacing	CODE	2.3

ALBERTA RANGE (SURVEYED)

CALGARY	175 m	LETHBRIDGE	120 m
EDMONTON	120 m	RED DEER	150 m
FT. McMURRAY	150 m	SHERWOOD PARK	120 m
HINTON	120 m	ST. ALBERT	120 m

LITERATURE RANGE (CURRENT USAGE) 175 m to 90 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
170 metres is cited as a cost-effective manhole spacing.
Curvilinear sewers are recommended to reduce the number of manholes.

ANALYSIS

Greater manhole spacing reduces both construction costs and maintenance costs by reducing the number of manholes to maintain. Since the primary purpose of a manhole is to allow access for cleaning, spacing should be related to effective range of existing sewer cleaning equipment.

SUGGESTED STANDARD

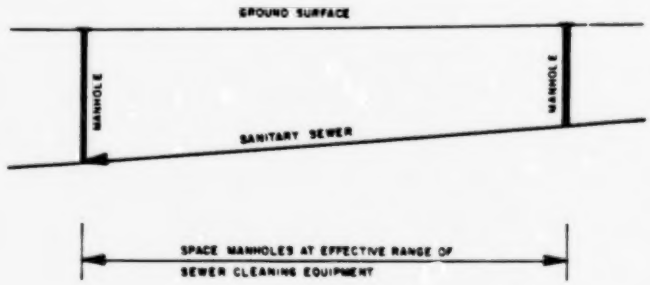
- Set maximum spacing at effective range of sewer cleaning equipment.
- Update as new equipment is purchased.
- Allow curvilinear sewers to one half the manufacturer's recommended allowable joint deflections.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



MAXIMUM ALLOWABLE MANHOLE SPACING	2.3

COMMENTS

ELEMENT	House service connections	CATEGORY	San. sewers
PURPOSE	To convey sewage from house to street system		
		DATE	June, 1986
SUBJECT	Shared Sanitary Sewer House Connections	CODE	2.4

ALBERTA RANGE (SURVEYED)

No = shared connections not allowed.

100 Ø = minimum diameter allowed, in mm.

CALGARY	No, 100 Ø	LETHBRIDGE	No, 100 Ø
EDMONTON	No, 150 Ø	RED DEER	No, 150 Ø
FT. McMURRAY	No, 100 Ø	SHERWOOD PARK	No, 100 Ø
HINTON	No, 100 Ø	ST. ALBERT	No, 100 Ø

LITERATURE RANGE (CURRENT USAGE) 100 Ø to 150 Ø. Few use shared connections.

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

Shared sewer house connections are feasible and have been used with no adverse maintenance implications. Potential jurisdictional problems and greater inconvenience can result if blockage occurs at common wye.

ANALYSIS

Shared connections reduce the number of street crossings and should reduce overall maintenance costs if properly designed and installed. The potential for possible hoimeowner inconvenience may be viewed as a drawback. 100 mm diameter at a gradient of 2% should be adequate for either a single or shared house connection.

SUGGESTED STANDARD

Allow shared sewer house connections with provision for access cleanout within the public right-of-way.

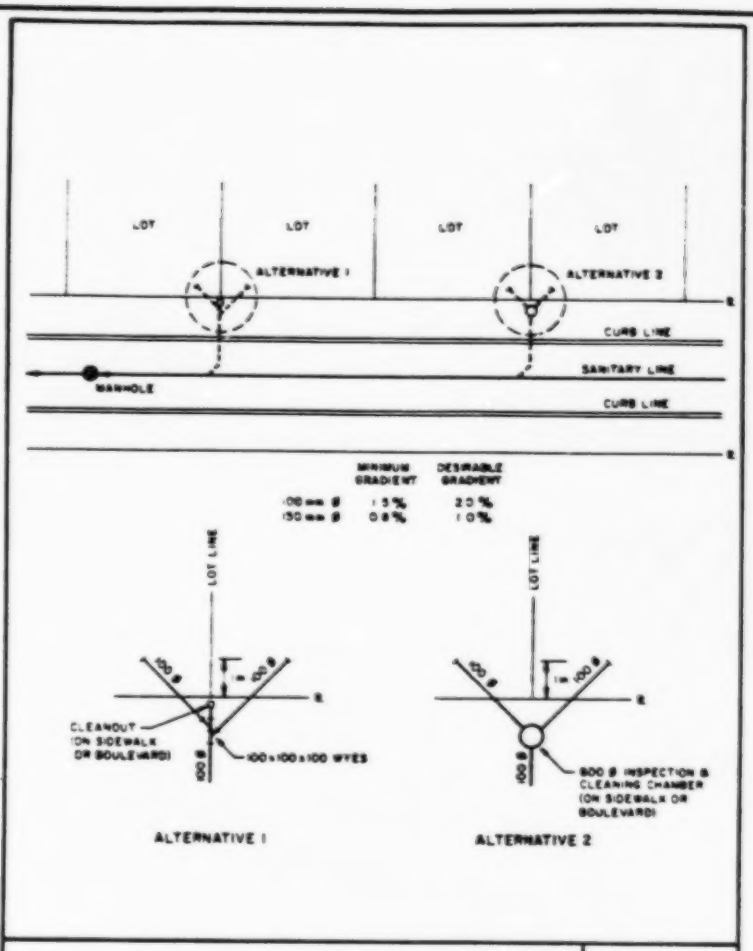
100 mm diameter @ desirable gradient of 2%.
@ absolute minimum gradient of 1.5%.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



SHARED SANITARY SEWER HOUSE CONNECTIONS | 2.4

COMMENTS

ELEMENT	Design storm-piped system	CATEGORY	Storm drainage
PURPOSE	To carry rain-water away with minimal inconvenience	DATE	June, 1986
SUBJECT	Storm frequency of recurrence interval	CODE	3.1

ALBERTA RANGE (SURVEYED)

CALGARY	5 years	LETHBRIDGE	5 years
EDMONTON	5 years	RED DEER	3 years
FT. McMURRAY	5 years	SHERWOOD PARK	5 years
HINTON	5 years	ST. ALBERT	5 years

LITERATURE RANGE (CURRENT USAGE) 10 years to 2 years

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
2-year return frequency design storm is recommended for cost effectiveness.

ANALYSIS
The shorter the interval chosen for the design storm the more frequent the occurrence of over-topping of the piped system. However, if an overland drainage plan for flows in excess of the design storm is in place, the level of inconvenience should be small. If basement sub-drains are not connected to the piped system, potential flooding of basements is also minimized.

SUGGESTED STANDARD

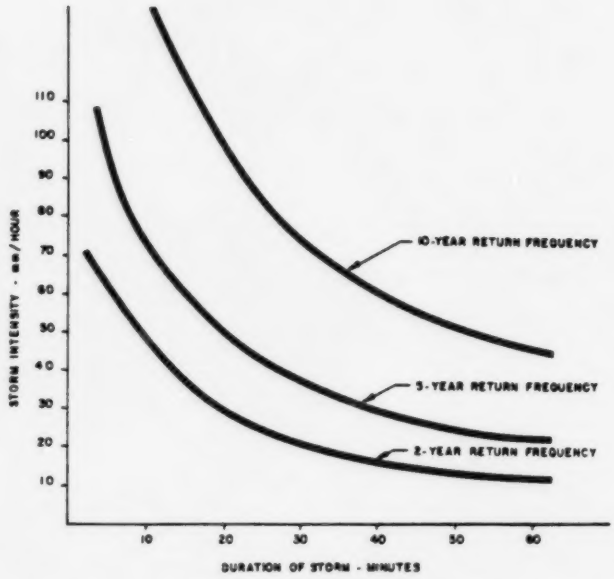
2-year return frequency design storm is adequate provided there is proper overland drainage for flows in excess of the 2-year storm up to the 100-year return storm, and sub-drains are connected to the piped system.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



NOTE THE ABOVE ARE SAMPLES ONLY

TYPICAL STORM INTENSITY - DURATION CURVES	3.1

COMMENTS

ELEMENT	Piped System	CATEGORY	Storm drainage
PURPOSE	To carry rain-water away with minimal inconvenience	DATE	June, 1986
SUBJECT	Minimum Storm Sewer Pipe Gradients	CODE	3.2

ALBERTA RANGE (SURVEYED)

CALGARY	0.9 m/s	LETHBRIDGE	0.9 m/s
EDMONTON	0.6 m/s	RED DEER	0.9 m/s
FT. McMURRAY	0.8 m/s	SHERWOOD PARK	0.9 m/s
HINTON	0.9 m/s	ST. ALBERT	1.0 m/s

LITERATURE RANGE (CURRENT USAGE) 1.0 m/s to 0.6 m/s

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

0.6 m is recommended as optimum for economy.

ANALYSIS

0.65 m/s is a theoretical minimum velocity to prevent sedimentation. Because storm sewers are prone to intrusion of rocks and gravel, 0.75 m/s is a preferrable minimum design velocity. 3 m/s is suggeted as a maximum velocity to prevent scour and erosion.

SUGGESTED STANDARD

Using a Manning "n" factor of 0.013, the following are suggested radients:

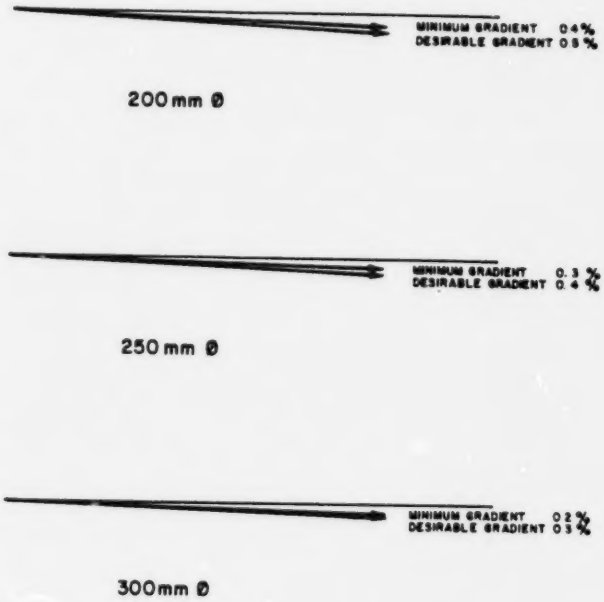
Pipe Size mm	Desirable Gradient (%)	Absolute Minimum Gradient (%)
200	0.5	0.4
250	0.4	0.3
300	0.3	0.2

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



MINIMUM STORM SEWER PIPE GRADIENTS	3.2

COMMENTS

ELEMENT	Manholes	CATEGORY	Storm drainage
PURPOSE	To allow access to piped system	DATE	June, 1986
SUBJECT	Maximum Allowable Manhole Spacing	CODE	3.3

ALBERTA RANGE (SURVEYED)

CALGARY	175 m	LETHBRIDGE	120 m
EDMONTON	120 m	RED DEER	150 m
FT. McMURRAY	150 m	SHERWOOD PARK	120 m
HINTON	120 m	ST. ALBERT	120 m

LITERATURE RANGE (CURRENT USAGE) 175 m to 90 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
170 metres is cited as a cost-effective manhole spacing.
Curvilinear sewers are recommended to reduce the number of manholes.

ANALYSIS
Greater manhole spacing reduces both construction costs and maintenance costs by reducing the number of manholes to maintain. Since the primary purpose of a manhole is to allow access for cleaning, spacing should be related to effective range of existing sewer cleaning equipment.

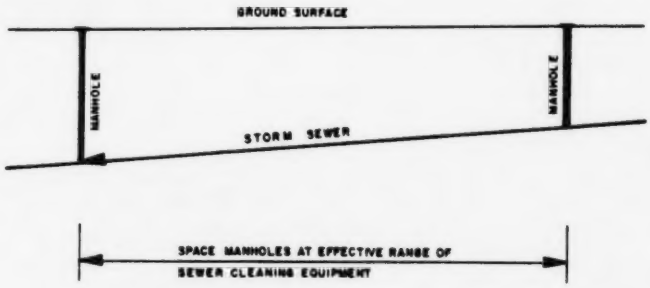
SUGGESTED STANDARD
- Set maximum spacing at effective range of sewer cleaning equipment.
- Update as new equipment is purchased.
- Allow curvilinear sewers to one half the manufacturer's recommended allowable joint deflections.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



MAXIMUM ALLOWABLE MANHOLE SPACING	3.3

COMMENTS

ELEMENT	Catch basins	CATEGORY	Storm drainage
PURPOSE	To direct surface rain water to the piped system	DATE	June, 1986
SUBJECT	Catch Basin Spacing	CODE	3.4

ALBERTA RANGE (SURVEYED)

CALGARY	150 m	LETHBRIDGE	300 m
EDMONTON	120 m	RED DEER	150 m
FT. McMURRAY	182 m	SHERWOOD PARK	365 m
HINTON	300 m	ST. ALBERT	120 m

LITERATURE RANGE (CURRENT USAGE) 365 m to 90 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
170 m is recommended for economy

ANALYSIS
Catch basin spacing should be determined by the gutter shape, street gradient and the grate capacity. The greater the street gradient, the greater the capacity of the gutter and consequently the greater the spacing between catch basins that can be allowed up to the limit of the grate capacity.

SUGGESTED STANDARD
No standard is suggested; each case should be analyzed with appropriate consideration for street gradient, gutter size and the inflow capacity of the catch basin grate design.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____

USE THE FOLLOWING CONSIDERATIONS :

1. USING MAXIMUM CAPACITY OF GRATING INLET, COMPUTE LENGTH OF STREET REQUIRED TO PRODUCE THAT STORM FLOW
2. WIDER AND DEEPER GUTTERS WILL ALLOW MORE FLOW THAN SHALLOW, NARROW GUTTERS WITHOUT SPILLOVER TO PAVEMENT.
3. GREATER STREET LONGITUDINAL GRADIENTS WILL INCREASE GUTTER CAPACITY BUT DECREASE INLET CAPACITY OF CATCH BASIN GRATE

CATCH BASIN SPACING	3.4

COMMENTS

ELEMENT	Storm sewer house connections	CATEGORY	Storm drainage
PURPOSE	To direct roof rain-water leaders and basement sub-drains to piped system	DATE	June, 1986
SUBJECT	Storm Sewer House Service Connections	CODE	3.5

ALBERTA RANGE (SURVEYED) — Connected to piped storm sewer system?

CALGARY	No	LETHBRIDGE	No
EDMONTON	No	RED DEER	No
FT. McMURRAY	No	SHERWOOD PARK	No
HINTON	No	ST. ALBERT	No

LITERATURE RANGE (CURRENT USAGE) Not widely used, except in B.C.

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

Literature recommends that roof drains need not be connected to any sewer. Basement sub-drains should be used where basement flooding is possible.

ANALYSIS

There is widespread agreement that roof drains need not be connected to storm sewer. Basement sub-drains are connected to storm sewer, and in some cases to sanitary sewer. Economy can be achieved by using a separate sub-drain system or a sump pump. Connection to sanitary sewer is not recommended.

SUGGESTED STANDARD

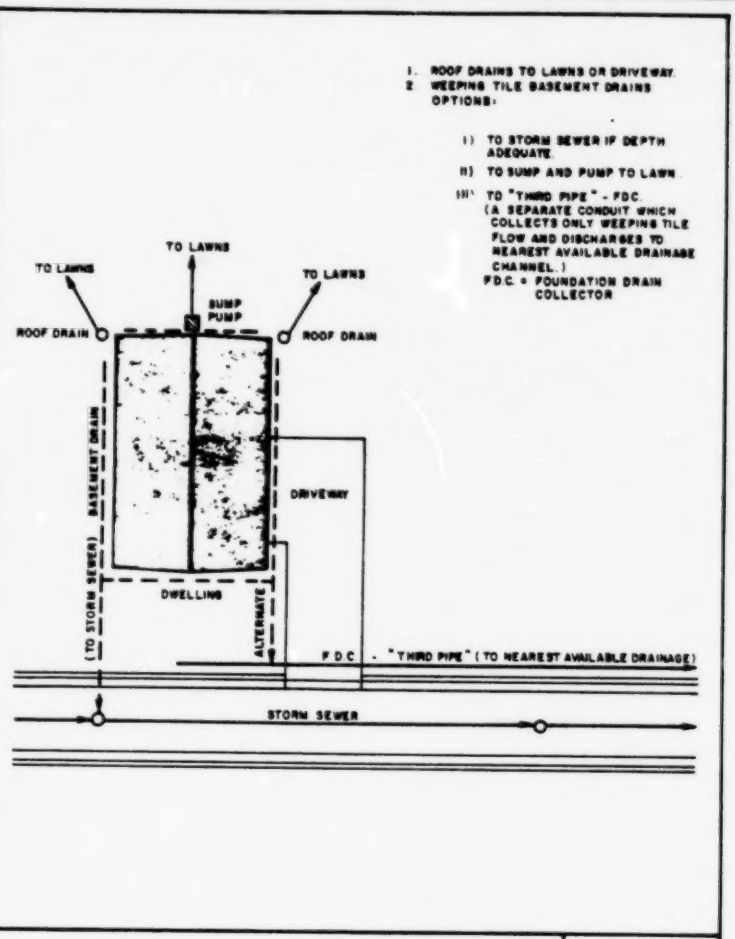
Connection of roof drains should be eliminated. Basement sub-drains should be used and be allowed to drain to a separate system or to a sump from which water can be pumped to the surface.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



STORM SEWER-HOUSE CONNECTION OPTIONS	3.5

COMMENTS

ELEMENT	Local road Right-of-Way	CATEGORY	Roadways
PURPOSE	To provide legal access to property		
		DATE	June, 1986
SUBJECT	Local Road Right-of-Way	CODE	4.1A

ALBERTA RANGE (SURVEYED)

CALGARY	15 m	LETHBRIDGE	20 m
EDMONTON	20 m	RED DEER	18 m
FT. McMURRAY	18-20 m	SHERWOOD PARK	18 m
HINTON	18 m	ST. ALBERT	20 m

LITERATURE RANGE (CURRENT USAGE) 20 m to 7.3 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Narrow rights-of-way are more cost effective.

ANALYSIS

Narrow rights-of-way use less land and contribute to increased density without reducing lot size. Front yard easements may be reuired for utilities but easements are more cost effective than wider rights-of-way.

SUGGESTED STANDARD

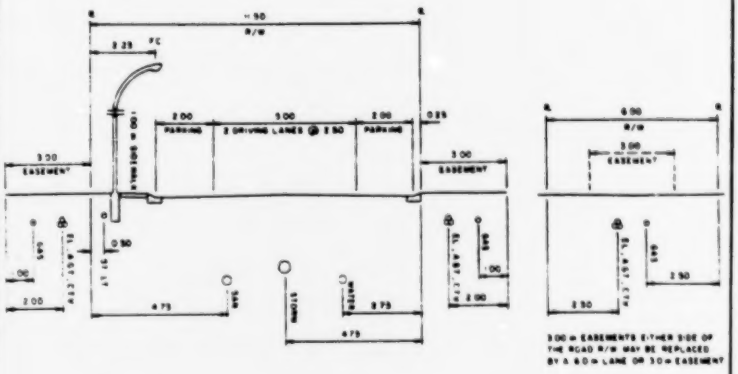
14 - 15 m for local residential streets with front yard easements as required. (Could be combined with narrow deep lots for lower servicing costs and increased separation between backs of homes).

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



RESIDENTIAL STREET - 11.50 m R/W (LOCAL ROAD)	4.1A

COMMENTS

ELEMENT	Minor local road right-of-way	CATEGORY	Roadways
PURPOSE	To provide legal access to property		
		DATE	June, 1986
SUBJECT	Minor Local Road Right-of-way	CODE	4.1B

ALBERTA RANGE (SURVEYED)

CALGARY	14 m	LETHBRIDGE	17 m
EDMONTON	15 m	RED DEER	16 m
FT. McMURRAY	--	SHERWOOD PARK	18 m
HINTON	25 m	ST. ALBERT	20 m

LITERATURE RANGE (CURRENT USAGE) 20 m to 5.4 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
No specific recommendations.

ANALYSIS
Only a few of the "across Canada' municipalities made provision for narrow rights-of-ways for minor roads serving a limited number of dwellings. In some instances the right-of-way need be no larger than the pavement width. Front yard easements may be required for shallow utilities.

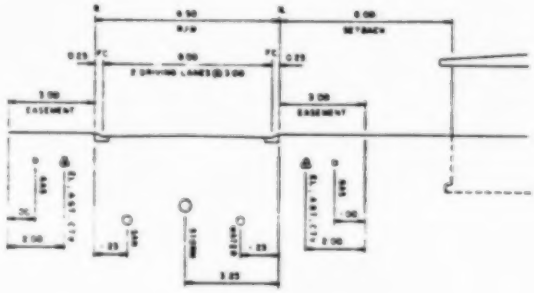
SUGGESTED STANDARD
6.5 to 7.5 m for small culs-de-sac, one way crescents, etc. where no parking is allowed.
11.5 - 12.5 m for similar roads with parking.
If number of houses served is greater than 15, road may fall into "Local Road" category (See 4.1A).

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



RESIDENTIAL STREET - 6.50m R/W
(MINOR LOCAL ROAD)

4.1 B

COMMENTS

ELEMENT	Local road - pavement width	CATEGORY	Roadways
PURPOSE	Provide access to property and movement of vehicles	DATE	June, 1986
SUBJECT	Local Road Pavement Width	CODE	4.2A

ALBERTA RANGE (SURVEYED)

CALGARY	9.5 m	LETHBRIDGE	11 m
EDMONTON	11.5 m	RED DEER	10 m
FT. McMURRAY	10 m	SHERWOOD PARK	9.75 m
HINTON	11 m	ST. ALBERT	9.0 m

LITERATURE RANGE (CURRENT USAGE) 11.5 m to 7 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Literature recommends 8 to 8.5 metre pavement width on local roads for economy.

ANALYSIS

If no parking is required, 7 to 8 metre pavement width is adequate for all vehicles including emergency vehicles. If on-street parking is provided, one (or two) lanes of 2 - 2.25 metres each should be added.

SUGGESTED STANDARD

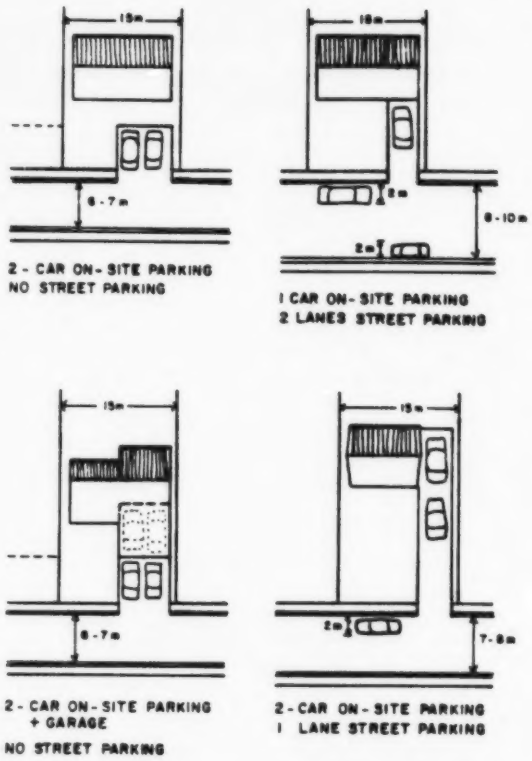
6-7 Metre minimum width with no parking.
7-8 Metre minimum width with parking one side.
8-10 Metre minimum width with parking both sides.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



LOCAL ROAD PAVEMENT WIDTHS	4.2 A

COMMENTS

ELEMENT	Minor local road pavement width	CATEGORY	Roadways
PURPOSE	Provide convenient access to property and movement of vehicles	DATE	June, 1986
SUBJECT	Minor Local Road Pavement Width	CODE	4.2B

ALBERTA RANGE (SURVEYED)

CALGARY	9.5 m	LETHBRIDGE	10 m
EDMONTON	9 m	RED DEER	10 m
FT. McMURRAY	10 m	SHERWOOD PARK	N/A
HINTON	9 m	ST. ALBERT	9 m

LITERATURE RANGE (CURRENT USAGE) 10 m to 7 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Literature recommends 8 m for minor local roads with reduction to 6 to 7 metres for culs-de-sac (40 dwellings or less).

ANALYSIS
For a minor local road, a 6-metre pavement width provides more than adequate space for vehicle movement. If on-street parking is desired, additional 2 to 2.25 metre lane must be provided on one or both sides of the road. A minor local road with front drive and space for on-site vehicles does not require on-street parking unless the development density is high.

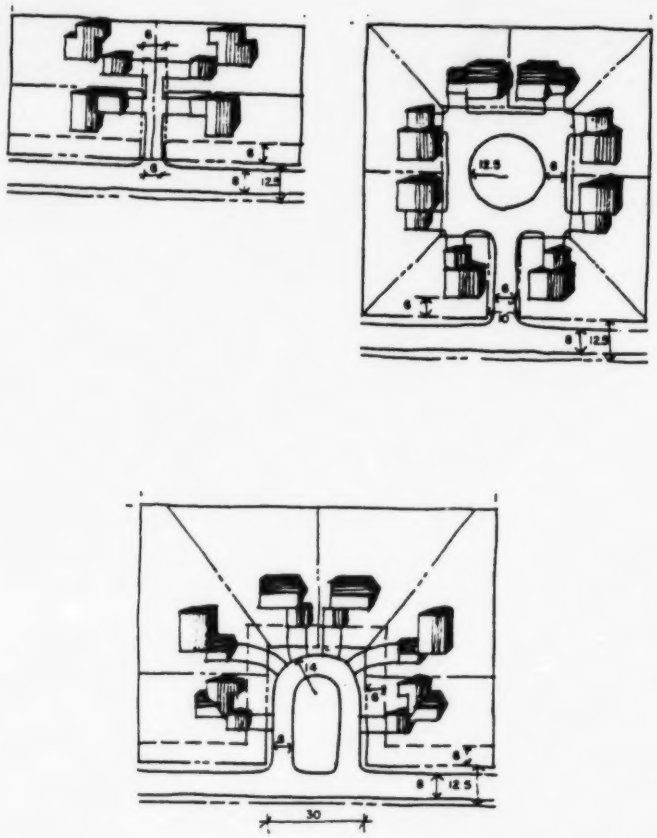
SUGGESTED STANDARD
Suggest adoption of a 6 metre minimum pavement width for minor locals. If parking is desired on one or both sides, then 2 to 2.25 metre should be added for each parking lane.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



MINOR LOCAL ROAD PAVEMENT WIDTHS	4.2 B

COMMENTS

ELEMENT	Lanes	CATEGORY	Roadways
PURPOSE	To provide vehicular/pedestrian and utility access to rear lot	DATE	June, 1986
SUBJECT	Lanes	CODE	4.3

ALBERTA RANGE (SURVEYED)

Are laneless subdivisions permitted?

Note: St. Albert does not allow laned subdivisions

CALGARY	Yes	LETHBRIDGE	Yes
EDMONTON	Yes	RED DEER	Yes
FT. McMURRAY	Yes	SHERWOOD PARK	Yes
HINTON	Yes	ST. ALBERT	Yes

LITERATURE RANGE (CURRENT USAGE) Extremely variable-lanes most common in in Western Canada.

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

No specific recommendation - some municipalities insist on laned subdivisions.

ANALYSIS

Laneless subdivsions are usually more cost effective than laned subdivisions. Elimination of the lane allows improved density and can improve overall amenity. Disadvantages include increased difficulty for rear utility servicing, and elimination of public access to rear yard.

SUGGESTED STANDARD

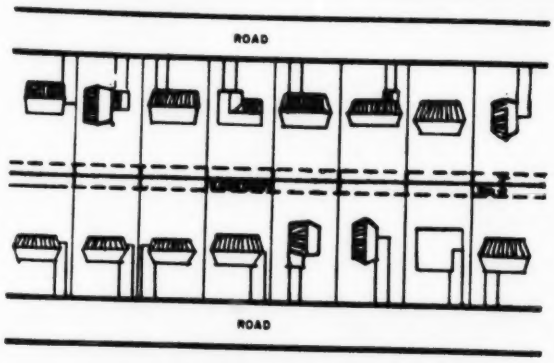
Use laneless subdivison design for all low density housing areas. Consider lanes only for higher density developments where rear parking, utilities and garbage collection is desirable. Lane width - 6 to 8 m depending upon density and expected usage. 8 m Width to be used if lanes accommodate most utilities.

MUNICIPALITY OF

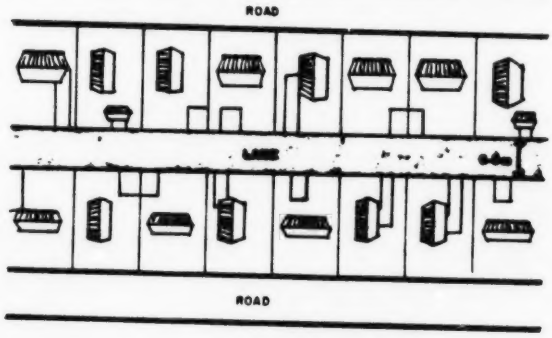
PRESENT STANDARD _____

REVISED STANDARD _____

_____



LANELESS - FRONT DRIVEWAYS
3-METRE SHALLOW UTILITY OR DRAINAGE EASEMENT AT REAR OF LOT



LANED - REAR DRIVEWAYS
6-METRE LANE FOR SHALLOW UTILITIES UP TO 8 METRES IF MORE UTILITIES ARE DESIRED

LANES	4.3

COMMENTS

ELEMENT	Sidewalks	**CATEGORY**	Roadways
PURPOSE	Pedestrian movement		
		DATE	June, 1986
SUBJECT	Sidewalks	**CODE**	4.4

ALBERTA RANGE (SURVEYED)

Legend: 1S - sidewalk one side only
2S - sidewalk both sides

CALGARY	1A	1S	**LETHBRIDGE**	1S	2S
EDMONTON	No	2S	**RED DEER**	2S	2S
FT. McMURRAY	2S	2S	**SHERWOOD PARK**	2S	2S
HINTON	2S	2S	**ST. ALBERT**	2S	2S

LITERATURE RANGE (CURRENT USAGE) Not available

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
For cost effectiveness eliminate sidewalks where they are not necessary.

ANALYSIS

The need for sidewalks should be related to expected use - they are normally not required on short culs-de-sac, bays, etc. especialy in low density detached housing areas. However, the elimination of sidewalks may increase hazard.

SUGGESTED STANDARD

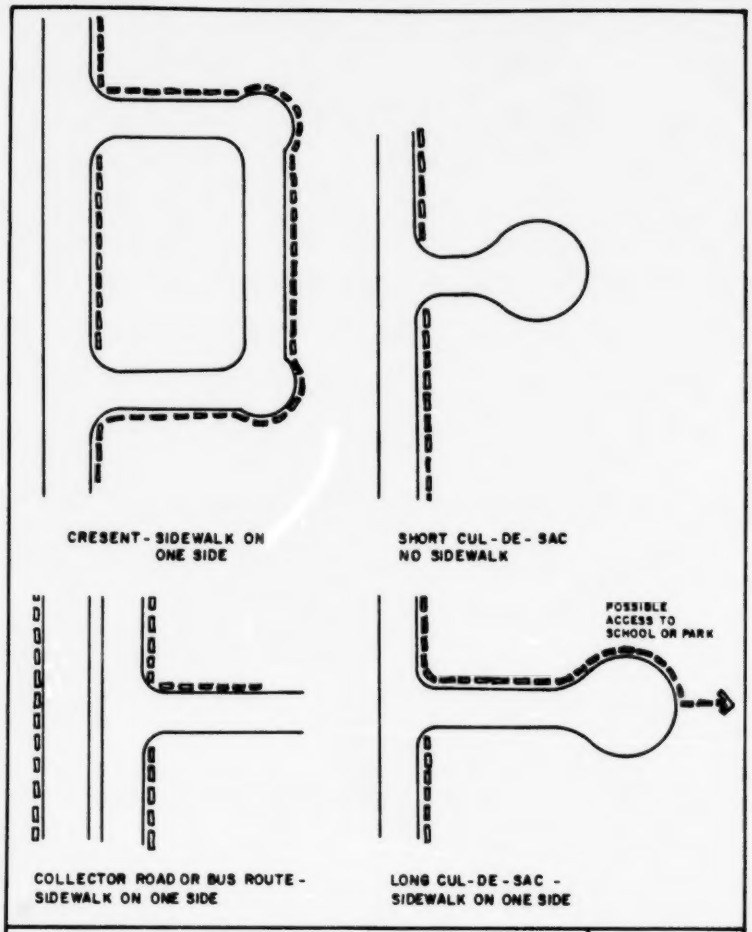
Eliminate sidewalk requirement on minor streets unless there is a specific walkway route to an activity area - local roads should have sidewalks on one side only.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



SIDEWALKS	4.4

COMMENTS

ELEMENT	Housing mix	CATEGORY	Planning
PURPOSE	To provide a variety of housing types and price ranges	DATE	June, 1986
SUBJECT	Housing Mix	CODE	5.1

ALBERTA RANGE (SURVEYED) Single family homes as a % of total housing units
N/A = Not Available
* This number includes semi-detached housing

CALGARY	50%	LETHBRIDGE	50%
EDMONTON	36%	RED DEER	N/A
FT. McMURRAY	50% *	SHERWOOD PARK	N/A
HINTON	50% *	ST. ALBERT	80% *

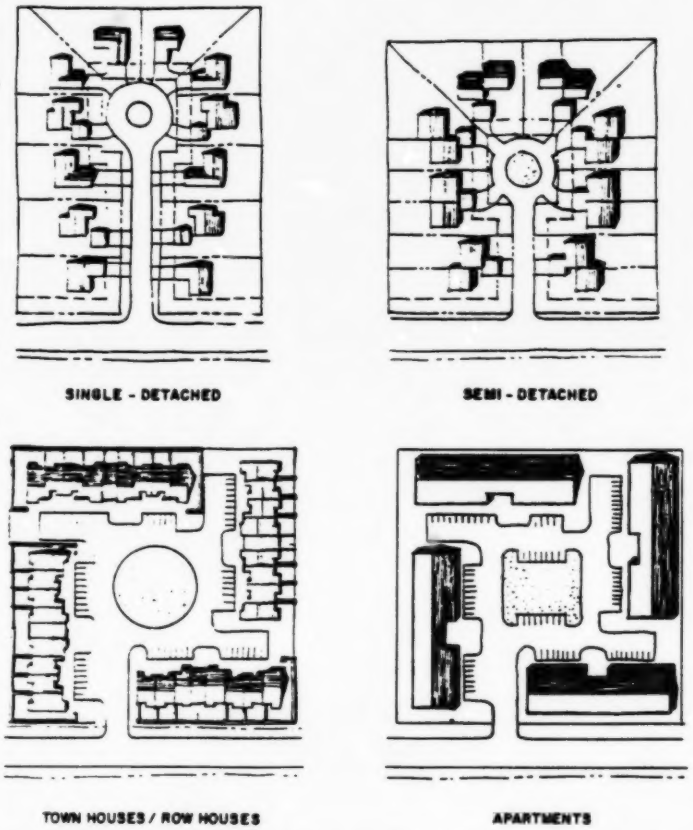
LITERATURE RANGE (CURRENT USAGE) 85% to 36%

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Lower ratios of single detached housing usually indicates higher average densitites and a more efficient urban structure.

ANALYSIS
Market demand will influence greatly the housing mix. In most communities extensive high-rise development is not popular but good quality semi-detached, townhousing and low-rise apartments are. For efficient use of roads and services, attached or small lot detached housing should be encouraged.

SUGGESTED STANDARD
No overall standard is suggested.

MUNICIPALITY OF
PRESENT STANDARD _____
REVISED STANDARD _____
_____



HOUSING MIX | 5.1

COMMENTS

ELEMENT	Zero lot line lotting	CATEGORY	Planning
PURPOSE	Elimination of one side yard		
		DATE	June, 1986
SUBJECT	Zero Lot Line	CODE	5.2

ALBERTA RANGE (SURVEYED)

Is zero lot line permitted?

CALGARY	Yes	LETHBRIDGE	Yes
EDMONTON	Yes	RED DEER	Yes
FT. McMURRAY	Yes	SHERWOOD PARK	Yes
HINTON	Yes	ST. ALBERT	Yes

LITERATURE RANGE (CURRENT USAGE) Not available

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

Effective method of increasing density - requires careful site planning and home design.

ANALYSIS

Only 14 of the 31 Canada wide municipalities studied allowed zero lot line development. This form of building location can contribute to increased density, improved house separation and space provision for side driveways. Disadvantages include - reduced flexibility in house design and legal access requirements for maintenance.

SUGGESTED STANDARD

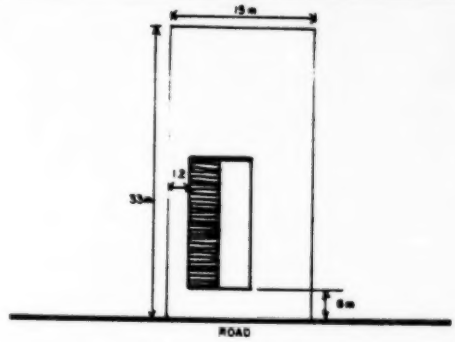
Land use bylaw should make provision for 'zero lot line' or zero side yard designs.

MUNICIPALITY OF

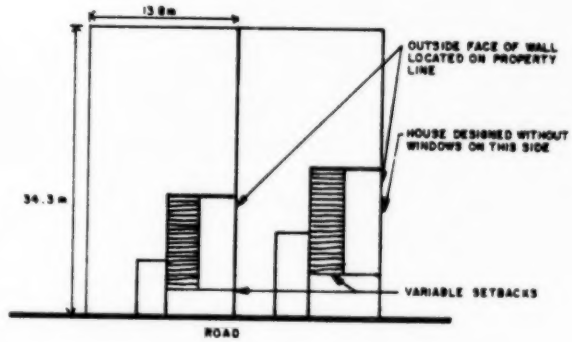
PRESENT STANDARD _____

REVISED STANDARD _____

_____



CONVENTIONAL 'A'



ZERO LOT-LINE 'B'

ZERO LOT-LINE	5.2

COMMENTS

ELEMENT	Density	**CATEGORY**	Planning
PURPOSE	A measure of subdivision efficiency		
		DATE	June, 1986
SUBJECT	Density	**CODE**	5.3

ALBERTA RANGE (SURVEYED)

N/A = Not Available

	Units/ acre	Units/ ha		Units/ acre	Units/ ha
CALGARY	18	45	LETHBRIDGE	15	37
EDMONTON	17	42	RED DEER	N/A	N/A
FT. McMURRAY	18	45	SHERWOOD PARK	15	37
HINTON	12	30	ST. ALBERT	12	30

LITERATURE RANGE (CURRENT USAGE) 40 units/acre to 10 units/acre

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS

No specific recommendations

ANALYSIS

The Alberta communities surveyed fall within the 12 -20 units/acre range. This was also the normal range for examples across Canada.

SUGGESTED STANDARD

No single standard can be recommended but 20 to 22 units per acre is the normal maximum (50 - 55 units/ha).

MUNICIPALITY OF

PRESENT STANDARD _____

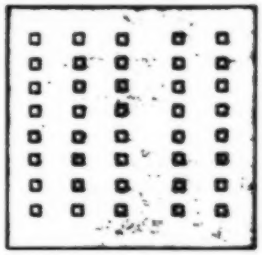
REVISED STANDARD _____

_____

1 ACRE
(SCHEMATIC)

LOWEST DENSITY FOUND
10 UNITS / ACRE
(24 UNITS / HECTARE)

1 ACRE
(SCHEMATIC)



HIGHEST DENSITY FOUND
40 UNITS / ACRE
(100 UNITS / HECTARE)

SUGGESTED AVERAGE
20 - 22 UNITS / ACRE
(50-55 UNITS / HECTARE)

HOUSING DENSITY RANGE	5.3

COMMENTS

ELEMENT	Lot area	CATEGORY	Planning
PURPOSE	Accommodation of dwelling unit		
		DATE	June, 1986
SUBJECT	Lot Area	CODE	5.4A

ALBERTA RANGE (SURVEYED) Lot areas in square feet (square metres)

	sq ft m^2		sq ft m^2
CALGARY	3,013 (280)	LETHBRIDGE	3,500 (325)
EDMONTON	3,875 (360)	RED DEER	5,995 (557)
FT. McMURRAY	4,000 (372)	SHERWOOD PARK	5,486 (510)
HINTON	6,997 (650)	ST. ALBERT	4,122 (383)

LITERATURE RANGE (CURRENT USAGE) 650 m^2 to 168 m^2

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
Smaller lots are more cost effective. In comparing equivalent lot areas, narrow deep lots are more cost efficient.

ANALYSIS

An exact lot size recommondation is not possible due to wide variation in market conditions from community to community. Smaller lots with their increased density make better use of land and utilities. For the same lot area, a narrower but deeper lot will be more efficient.

SUGGESTED STANDARD

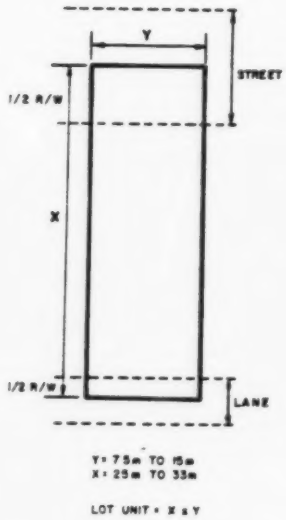
No single standard can be recommended; however, it is advisable to allow flexibility in density and housing mix factors to encourage increased overall development density. Maintain variety but emphasize smaller lots. The land use bylaw should allow for small lots in the 8 - 10 m (25 - 33 feet) width range.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



LOT AREA	5.4A

COMMENTS

ELEMENT	Lot frontage for detached houses	CATEGORY	Planning
PURPOSE	To provide access to the road right-of-way	DATE	June, 1986
SUBJECT	Lot Shape	CODE	5.4B

ALBERTA RANGE (SURVEYED)

CALGARY	9 m	LETHBRIDGE	10.7 m
EDMONTON	12 m	RED DEER	15 m
FT. McMURRAY	N/A	SHERWOOD PARK	15 m
HINTON	8 m	ST. ALBERT	11.5 m

LITERATURE RANGE (CURRENT USAGE) 18.2 m to 6 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
No specific recommendation.

ANALYSIS
For optimum cost effectiveness lot widths should be kept small - extra lot area can be provided by making deeper lots. Lot pricing is often directly limited to 'front footage'.

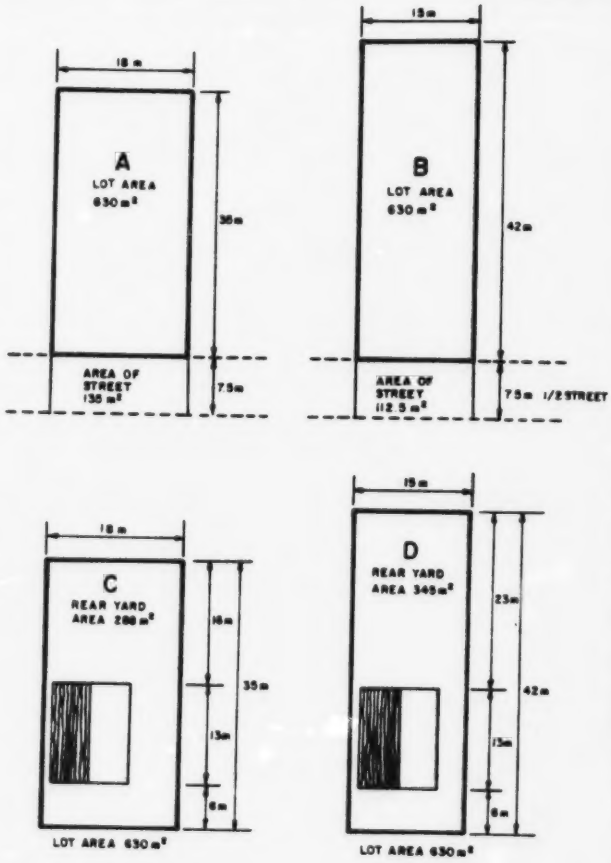
SUGGESTED STANDARD
7.5 m (min) for rectangular lots, 3 m (min) for pie shaped lots and other special design. Land use bylaw should allow for narrow frontage lots thus providing flexibility for innovative lot design. Lot size can still be controlled by minimum area provision.

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



LOT SHAPE | 5.4 B

COMMENTS

ELEMENT	Setbacks	CATEGORY	Planning
PURPOSE	To provide separation between building and property line	DATE	June, 1986
SUBJECT	Setbacks	CODE	5.5

ALBERTA RANGE (SURVEYED)

CALGARY	3 m	LETHBRIDGE	6 m
EDMONTON	6 m	RED DEER	N/A
FT. McMURRAY	6 m	SHERWOOD PARK	6 m
HINTON	7.5 m	ST. ALBERT	4.5 m (1-storey) 6 m (2-storey)

LITERATURE RANGE (CURRENT USAGE) 7.6 m to 3.0 m

LITERATURE RECOMMENDATIONS FOR COST EFFECTIVENESS
No specific recommendation.

ANALYSIS
Variable setbacks depending on the height and type of housing unit should be considered. St. Albert has a height related setback provision. In some instances front yard setbacks will be governed by location of front yard utility easements.

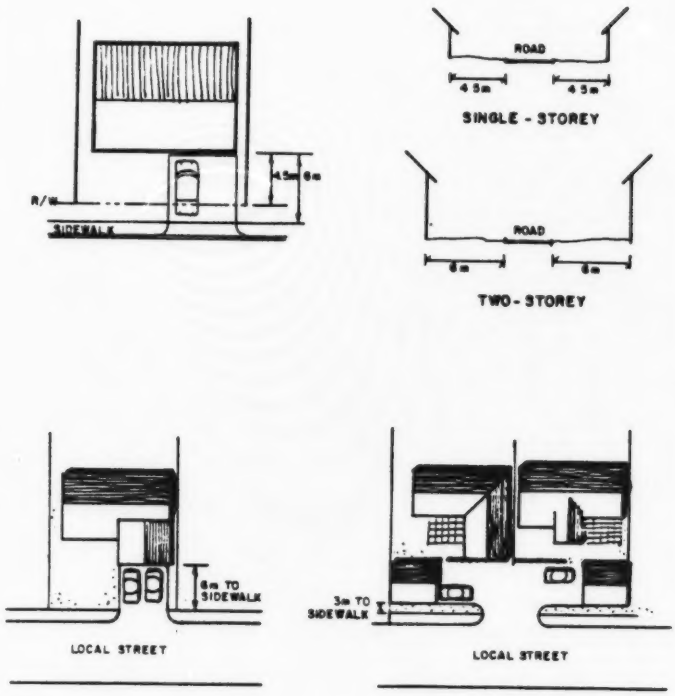
SUGGESTED STANDARD (Minimum Setbacks)
6 m setback from sidewalk if front drive garage or parking pads are permitted.
6 m setback from R of W for two storey homes.
4.5 m setback from R of W for single storey homes.
3.0 m for special design (parallel garage, etc.)

MUNICIPALITY OF

PRESENT STANDARD _____

REVISED STANDARD _____

_____



SETBACKS	5.5

COMMENTS

APPENDIX · I ·

QUESTIONNAIRE - MUNICIPAL INFRASTRUCTURE
ANNUAL OPERATION AND MAINTENANCE COSTS

Name of Municipality: _____

CATEGORY 1 - WATERWORKS

1. Current Standards:

   a) Minimum watermain pipe size required: _____mm
   b) Minimum hydrant spacing: _____m
   c) Minimum valve spacing: _____m

2. Annual operation and maintenance costs:

   a) Total annual cost of watermain maintenance: _____$/km
      Estimated proportion of annual cost due to:

      i) Repair of breaks/leaks _____%
      ii) Thawing of frozen mains _____%
      iii) Repairs of valves/fittings _____%
      iv) Corrosion repairs _____%

   b) Total annual cost of house service line maintenance: _____$/each
      Estimated proportion of annual cost due to:

      i) Repair of breaks/leaks _____%
      ii) Thawing of frozen lines _____%
      iii) Repair of curbstops _____%

   c) Total annual cost of hydrant maintenance _____$/each
      Estimated proportion of annual cost due to:

      i) Repair of breaks/leaks _____%
      ii) Repair of valves/fittings _____%
      iii) Corrosion/painting _____%

CATEGORY 2 - SANITARY SEWERS

1. Current Standards:

   a) Minimum sanitary sewer pipe size: _____mm
   b) Minimum gradient required for above pipe size: _____%
   c) Minimum manhole spacing required: _____m
   d) Are curved sewers allowed _____Yes _____No

2. Annual operation and maintenance costs:

   a) Total annual cost of sanitary sewer line maintenance _____$/km
      Estimated proportion of annual cost due to:

      i) Cleaning _____%
      ii) Repair of breaks/leaks _____%
      iii) Blockages _____%
      iv) Thawing frozen lines _____%

   b) Total annual cost of manhole maintenance _____$/each
      Estimated proportion of annual cost due to:

      i) Cleaning _____%
      ii) Breaks/Leaks _____%
      iii) Blockages _____%
      iv) Adjustment of frames/covers _____%

   c) Total annual cost of house service line maintenance _____$/each
      Estimated proportion of annual cost due to:

      i) Cleaning _____%
      ii) Breaks/Leaks _____%
      iii) Blockages _____%
      iv) Thawing frozen lines _____%

CATEGORY 3 - STORM DRAINAGE

1. Current Standards

   a) Design storm frequency interval _____2 yr _____5 yr _____10 yr
   b) Minimum storm sewer pipe size _____mm
   c) Minimum manhole spacing required _____m
   d) Minimum catch basin spacing required _____m
   e) Are curved sewers allowed _____Yes _____No

2. Annual operation and maintenance costs

   a) Total annual cost of storm sewer line maintenance _____$/km
   Estimated proportion of annual cost due to:

      i) Cleaning _____%
      ii) Repairs of breaks/leaks _____%
      iii) Blockages _____%
      iv) Thawing frozen lines _____%
      v) Flooding damage _____%

   b) Total annual cost of manhole and catch basin maintenance _____$/each
   Estimated proportion of annual cost due to:

      i) Cleaning _____%
      ii) Repair of breaks _____%
      iii) Blockages _____%
      iv) Adjustment of frames/grates _____%
      v) Flooding damage _____%

CATEGORY 4 - ROADWAYS

(Note: This applies only to local neighbourhood roads and does not include collectors, arterials, etc.)

1. Current Standards:
   a) Minimum right-of-way width _____m
   b) Minimum pavement width _____m
   c) Are local roads cleared of snow _____Yes _____No
   d) Are local roads sanded _____Yes _____No
   e) Are lanes required _____Yes _____No
   f) Are sidewalks required ___Yes ____No ____One Side ____Two Sides
   g) Is monolithic sidewalk/curb allowed _____Yes _____No

2. Annual operation and maintenance costs
   a) Total annual cost of roadway maintenance (local roads only) _____$/km

      Estimated proportion of annual cost due to:
      i) Snow removal _____%
      ii) Sanding/Sweeping _____%
      iii) Pothole repairs _____%
      iv) Crack sealing/overlays _____%
      v) Utility trench settlements _____%

   b) Total annual cost of lane maintenance _____$/km

      Estimated proportion of annual cost due to:
      i) Snow removal _____%
      ii) Re-gravelling _____%
      iii) Dust control _____%

   c) Total annual cost of sidewalk/curb & gutter maintenance _____$/km

      Estimated proportion of annual cost due to:
      i) Repairs of cracks/breaks _____%
      ii) Boulevard maintenance _____%